newtechnology

Number 66 March 1973 A supplement to *Trade and Industry*

Low-cost conveyor gets into the garment industry—and elsewhere

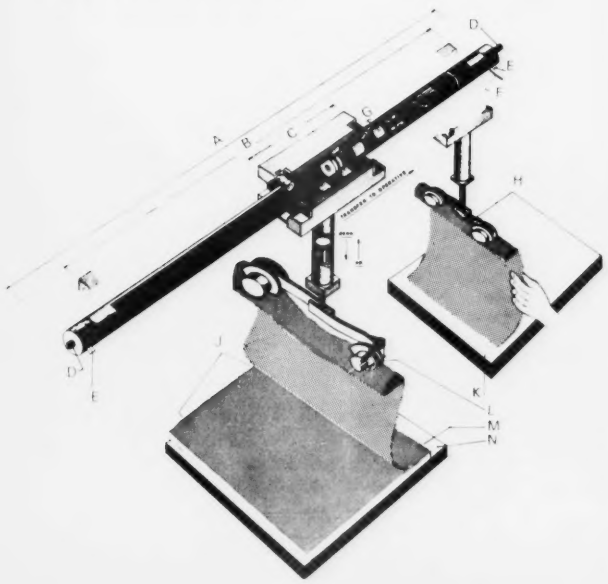
Labour-intensive industries have been prime targets for the Department of Trade and Industry's low-cost automation campaign—aimed at encouraging the investigation and adoption of small-scale mechanisation and automatic control devices. Emphasis has been on demonstrating that this need not be costly or complicated, yet can result in worthwhile increases in productivity.

The labour-intensive garment industry has been a focal point for the efforts of the DTI's Low-Cost Automation Section, with one of the areas with possibilities for significant savings being the garment assembly process. About three years ago a development contract was placed with the Marine Engineering Co. (Stockport) Ltd., for the evolvement of a series of devices for low-cost, safe and simple transportation of cut fabric pieces from a stack to a sewing machine operative, with facilities for orientating the pieces.

The project fell naturally into two sections—the search for a simple transporting mechanism, and the development of a gripping mechanism which would seize only the top piece of fabric, and which could be adjusted to deal with a wide range of fabric weights and textures. After a review of known linear transporters, it was decided that pneumatic operation, variable speed and personnel safety were to be the main criteria of the design, which finally evolved as illustrated (left).

Schematic drawing of a Mardrive linear transporter with gripper mechanism suitable for conveying pieces of cloth.

A—overall length
B—carriage travel
C—carriage length
D—inner adjustable stops
E—air connections
F—end cap retaining spring
G—slug out of position for clarity
H—automatic release point
J—variable grip pick-up points
K—work table (machine operator)
L—gripper coil
M—limp fabrics stack
N—work table



In the Mardrive system a magnetised slug inside an aluminium alloy tube is driven by line air pressure in either direction at a speed determined by a control circuit. A light carriage runs along the outside of the tube on low friction nylon rollers running on a flat track. The carriage also contains permanent magnets which are attracted strongly to the slug so that the carriage closely follows any slug movement.

Positional accuracy depends on the chosen means of control, which can vary from physical stops fitted to the tube giving absolute accuracy to fluidic switches or an infra red system, which can control to better than 0.0001 in. The most recent means of control to be tried successfully is the use of reed switches to break the magnetic field of the external carriage. Speeds of up to 30 ft/sec. can be achieved with loads up to 100 lb. The longest transporter so far constructed is an 18 ft. model shown at the last National Low-Cost Automation Exhibition, but the design is such that there is no limit to practical length.

The gripper mechanism consists of one or more coil springs which are normally released. When a piece of fabric is to be seized the spring is first contracted by a small inbuilt pneumatic cylinder then lowered on to the fabric and released by the cylinder. The material is nipped between the turns of the spring. A very wide range of materials can be gripped, according to the type of spring used and the degree at which it is opened.

A toothed-belt intermittent-motion variation of the conveyor has been developed which enables the speed of the conveyors to be varied according to the transport demand, or alternatively, the conveyor can operate in a hunting mode.

Vertical transportation is possible and Marine Engineering is prepared to consider appropriate designs.

As a result of the DTI contract, the company put on the market nearly 18 months ago a system known as the Mardrive linear transporter, which could be loosely described as a pneumatic linear motor. One of these transporters was installed last November in the clothing section of the Belmont Manufacturing Co. Ltd. at Denton, in Manchester. It is being used to move cotton linings for injection moulded footwear from a sewing machine to a stacking point. The company estimates that the system is capable of moving about 30 sections a minute. For a comparatively modest investment of

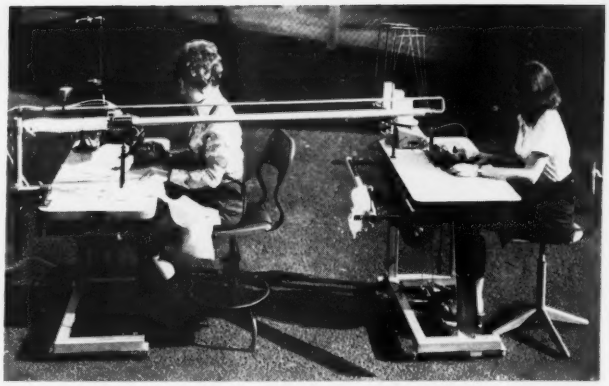
about £150, the firm has been able to speed up this operation in the clothing department by between 50 and 60 per cent.

Marine Engineering has already met with success in marketing the linear transporter in the clothing industry, both in Britain and overseas. Among countries to place orders are Japan, Sweden and South Africa.

However, the mechanism has considerable potential in other industries. The transporter, without the gripper, is capable of many variations, such as carrying items by the use of auxiliary clamps or vacuum pads, or carrying cutting tools. It lends itself for useful adoption in the food industry, and in the sphere of motor vehicle manufacturing it has been used for conveying brake and clutch linings prior to baking.

Other applications include automatic door opening and closing; reciprocating table operation; removal of welding fumes, and automatic welding screen placing. Another model is suitable for use in crack detector probes, scanning devices, automatic slitting, automatic spray painting, automatic pulling, automatic positioning of components and automatic glass cutting.

More information: Mr. G. Carroll, Director, The Marine Engineering Co. (Stockport) Ltd., Bulkeley Street, Edgeley, Stockport, Cheshire (tel: 061-480 2008/9), or Mr. E. E. Fox, Department of Trade and Industry, M4 Branch, Abell House, John Islip Street, London SW1 (tel: 01-834, 4422, ext. 708/325).



This demonstration shows how the linear transporter can be used in the garment industry for conveying material from one working position to another.

New Instruments for Detecting Dangerous Gases

Long gone are the days when coal miners reckoned the amount of methane in the atmosphere by the colour and height of a candle flame. Today there is a selection of instruments available to give an accurate estimate of gas concentrations in mines. Many of these instruments are the outcome of work carried out at the Government's Safety in Mines Research Establishment (SMRE) in Sheffield. The instruments range from simply-operated, hand-held units to completely automatic monitoring systems that will continuously measure the methane concentrations in any part of a mine and operate an alarm if the concentration exceeds a preset level. Here we mention some of the instruments which have, in collaboration with SMRE, been put into commercial production. Although developed primarily for use in mines, often these products have applications in other industrial, and even domestic, spheres.

The Type D6 Methanometer, a new pocket-size instrument for detecting methane, being manufactured by Mine Safety Appliances Co. Ltd.

Among the latest gas detection instruments to be developed at SMRE is a pocket-size methanometer (*illustrated*). This instrument, the Type D6, has recently been put into commercial production by Mine Safety Appliances Co. Ltd., and is intended for use in mines to detect firedamp, an explosive gas that consists largely of methane. A similar instrument is made by Becorit (GB) Ltd.

The gas-sensing element in these instruments is a catalytic type developed some time ago at SMRE: this element is used in several other commercially-available methane measuring instruments. The element combines high sensitivity and very good long-term stability, so that instruments based on it are accurate and are highly reliable.

The element can also be used to detect most other explosive gases, many toxic gases, and oxygen deficiency. An interesting application of the element is in a simple and cheap alarm for giving warning of a leakage of gas, such as natural gas, in blocks of flats and other large buildings. This alarm is being manufactured by International Gas Detectors Ltd.

Several other principles of gas detection are being studied at SMRE. Improved oxygen-measuring instruments, based on a novel form of polarographic electrode, are almost at the commercial production stage and they should be of great value in the detection of asphyxiating atmospheres which can be a serious threat to life in many industries. Two companies, Draeger Normalair Ltd. and J. and S. Sieger Ltd., have been licensed to manufacture the instruments.

In addition to carrying out its own programme of development work on gas detection instruments, SMRE also gives advice and assistance and carries out contract work on gas-detection problems for outside organisations.

More information: The Director, Safety in Mines Research Establishment, Off Broad Lane, Sheffield S3 7HQ. Tel: 0742 78141.

Wash Primers—Versatile Coatings with High Adhesion

by P. Walker, Atomic Weapons Research Establishment, Aldermaston

This is the fourth in a series of articles we are presenting on various aspects of AWRE's work in the field of organic protective coatings. In the June 1972 issue the author discussed the factors affecting the adhesion of such coatings to metals. In the subsequent issue he considered the selection of coatings for use on surfaces exposed to radioactive contamination. Last November in *New Technology,* Mr. Walker outlined work carried out at Aldermaston to develop coatings suitable for use as thermal-control surfaces in space. In this issue the author deals with investigations undertaken by AWRE into the qualities, properties and proper uses of various wash primers.

It is their outstanding adhesive qualities which lend wash primers to their prime function as an initial covering on such metals as aluminium and cadmium in preparation for subsequent coats of paint. Their anti-corrosion properties is a secondary benefit, but their degree of corrosion resistance can be improved by phenolic modification, such as a two-pack system (referred to later).

Wash primers were developed during World War II for use on US Navy ships and are known under a multiplicity of names, including etch primer, self etch primer, pretreatment primer and etching primer. The most successful composition developed at that time was designated WP1 (wash primer 1) and was characterised by outstanding adhesion to a variety of metals, and the property of providing an excellent substrate for subsequent coats of paint. Wash primers were also used on that wartime and postwar workhorse of the seas—the Liberty ship.

Basic primer

WP1 described in detail in British Defence Specification DEF1408 consists essentially of a dispersion of zinc tetroxychromate pigment in a solution of polyvinyl butyral resin to which an alcoholic solution of phosphoric acid is added just before use. A further modification to the basic primer is the addition of an alcohol soluble phenolic resin to confer added water resistance. This composition, with or without phenolic resin modification, is a two-pack system, but one-pack systems are known and have been evaluated by the author. Here I describe some of the more interesting aspects of the work carried out at AWRE to evaluate wash primers of both types.

Several of the alternative names for wash primers include the word etch, inferring that these primers in some way rely on the etching of the metal surface for their excellent adhesion to the substrate. The earliest reference known which suggested that wash primers do etch the surface, appeared in 1951, although no evidence was given which supported the statement. A year later the same author was using the term etch primer. In order to investigate this claim to self etching properties, work was carried out at AWRE on a basic WP1 type, and on a single-pack wash primer. In this investigation, steel and aluminium surfaces were characterised by electron microscopy before and after application of wash primers and after removal of the primers. Figures 1 and 2 show a mild steel surface before the application of WP1 and after its application and subsequent removal.

The electron micrographs indicated that the application of

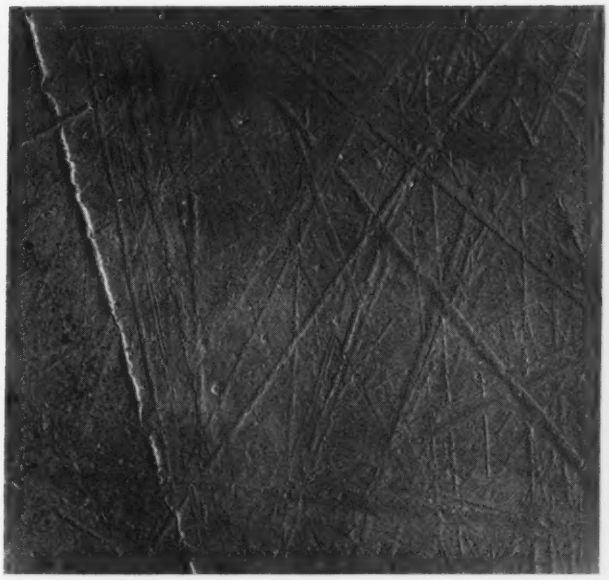


Figure 1. A direct replica of a mild steel panel before the application of WP1 wash primer (magnification X21,000).

Figure 2. A direct replica of a mild steel surface after the application and subsequent removal of WP1 wash primer (magnification X21,000).

wash primers cause the formation of a surface layer on the steel and aluminium which could sometimes be removed by the replica techniques used in electron microscopy. It is suggested that this layer is an inorganic phosphate, the presence of which has been postulated by other writers. Where this had been removed, the metal surface was almost invariably smoother than the original surface. As it is generally considered that the process of etching causes a surface roughening and a consequent increase in surface area, the term etch primer must

be considered to be a misnomer, and the original name of wash primer is more appropriate.

The role of a wash primer is to provide good adhesion to the substrate and to improve the corrosion resistance and adhesion of a superimposed paint system. It has been considered unlikely that they will provide long-term protection as a single coat, as the film thickness is usually below 0.00075 in. and microscopy has shown the film to be somewhat discontinuous. Undoubtedly the adhesion of the wash primers is outstanding, both on initial application and after exposure to hostile environments: this is shown in Table 1. The adhesion measurements were carried out by the 'direct pull off' technique: circular specimens were cut from the test panel, bonded between cylindrical test pieces and broken on a Hounsfield Tensometer. The equipment is shown in Figure 3.

The results indicate that although there is little difference in the initial adhesion—in fact the values for the single-pack material are rather higher—exposure to such hostile environments as salt spray and humidity under condensation conditions does cause a reduction in adhesion, greater than for the two-pack primers.

Mode of failure

Where the Table 1 indicates no removal of the primer from the surface, the actual mode of failure was cohesive—the primer layer failed within itself—and the value recorded is that of the strength of the paint rather than the adhesion. It follows, therefore, that the actual adhesion is at least as great as the tensile strength.

Wash primers also adhere well to metals other than mild steel and aluminium, and may be used on cadmium, magnesium alloys and nickel plate. Typical adhesion values for two-pack and single-pack primers are shown in Table 2.

It can be seen that some of the values, particularly for the one-pack Primer B, are extremely high; values greater than 6,000 lbf/in^2. can be considered outstanding. In the case of Primer A, rather more adhesion failure has occurred and the values are considerably lower. Although only the results for two single-pack primers are given in this paper, four other single-pack primers of different compositions have been examined in detail. Some appear to be somewhat specific in the metals to which they adhere well, and the user must beware of thinking that any single-pack primer can be considered as a complete substitute for a two-pack primer.

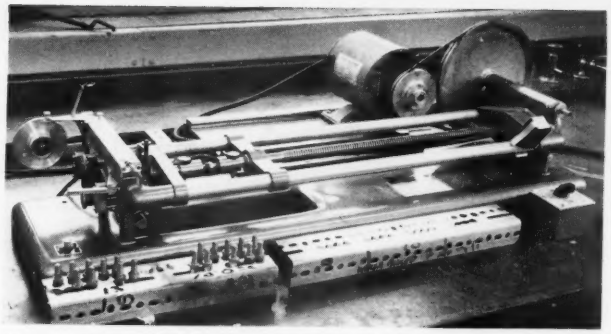


Figure 3. A Hounsfield Tensometer used to measure the adhesion qualities of various types of wash primer.

All the primer/substrate combinations shown in Table 2 were tested as single coats for corrosion resistance to both continuous salt spray and humidity under condensation conditions. Primer B performed at least as well as the two-pack primers on all substrates.

It has been suggested that the adhesion of subsequently applied coats of paints is not as high on the single-pack wash primer as on the two-pack—expressed differently, the intercoat adhesion is not as good. Conventional adhesion tests do not support this, but certainly impact tests can show failure when

Table 1. Adhesion after exposure to hostile environments

	Mild Steel			Aluminium		
Wash Primer Type	Initial adhesion lbf/in.^{2}/area removed	After exposure to salt spray lbf/in.^{2}/area removed	After exposure to high humidity lbf/in.^{2}/area removed	Initial adhesion lbf/in.^{2}/area removed	After exposure to salt spray lbf/in.^{2}/area removed	After exposure to high humidity lbf/in.^{2}/area removed
WP1 (DEF 1408) (two-pack)	4600/0	4700/0	4300/10	4300/0	3450/20	3850/0
Phenolid modified (DTD 5555) (two-pack)	4400/0	4100/10	4450/0	4200/0	4600/0	4200/0
Single-pack A	5000/0	2350/60	4500/0	4500/0	4000/70	3400/0
Single-pack B	4450/0	4100/70	3950/30	6000/0	3600/30	3900/100

Table 2. Adhesion of one- and two-pack wash primers to various metals

	Primer A (single-pack)		Primer B (single-pack)		WP1 DEF 1408		DTD 5555	
Substrate	Adhesion lbf/in.^{2}	Site of failure	Adhesion lbf/in.^{2}	Site of failure	Adhesion lbf/in.^{2}	Site of failure	Adhesion lbf/in.^{2}	Site of failure
Aluminium spray on steel	5800	10% C/P	7600	15% A/S 85% C/P	6400	100% C/P	3600	100% A/S
Zinc spray on steel	3900	Zinc from steel	5200	85% A/S 15% C/P	3800	100% C/P	3400	100% A/S
Cadmium plate	3100	100% A/S	5300	10% A/S 90% C/P	6000	10% A/S 90% C/P	5600	10% A/S 90% C/P
Cadmium plate (passivated)	2400	100% A/S	5000	100% A/S	5200	100% A/S	6400	100% A/S
Nickel plate	3800	100% A/S	6600	20% A/S 80% C/P	6800	10% A/S 90% C/P	4900	15% A/S 85% C/P
Chromated magnesium	5500	10% A/S 90% C/P	6600	10% A/S 90% C/P	6000	100% A/S 90% C/P	5700	20% A/S 80% C/P
Aluminium/ magnesium alloy	6700	10% A/S 90% C/P	6400 +	No failure	6400	60% A/S 40% C/P	5000	10% A/S 90% C/P
Lead	700	100% A/S	2000	100% A/S	2000 +	Metal failed	2000 +	Metal failed

C/P = cohesional failure in primer A/S = adhesion failure to substrate

Table 3. Exterior exposure results on single coats of wash primer after one year

Primer/substrate	Type	Appearance	Blistering	Checking	Corrosion		Remarks
					Un-stripped	Stripped	
DEF 1408/aluminium	2 Pack	5	Nil	5	Re. 0	Re. 0	Panel in excellent condition
DEF 1408/steel	2 Pack	2	9 Dense	5	Re. 8	Re. 8	No general corrosion staining
Phenolic modified/aluminium	2 Pack	5	Nil	5	Re. 0	Re. 0	Panel in excellent condition
Phenolic modified/steel	2 Pack	4	9	5	Re. 3	Re. 3	No general corrosion staining
Primer A/aluminium	1 Pack	5	Nil	6	Re. 0	Re. 0	Panel in excellent condition
Primer A/steel	1 Pack	4	Nil	5	Re. 1	Re. 1	Isolated pin-point blistering
Primer B/aluminium	1 Pack	5	Nil	5	Re. 0	Re. 0	Panel in excellent condition
Primer B/steel	1 Pack	4	Nil	5	Re. 1	Re. 2	Scattered small corrosion spots

5 = No change 2 = ASTM D714-516 3 = European Photographic Scale 0 = Complete breakdown

the single-pack system has been used, while the two-pack primers do not fail in this way. However, when both coating systems have been exposed to exterior weathering for periods of three to six months, before impact testing, then intercoat adhesion failure occurs with both types. Any superiority in intercoat adhesion of the two-pack systems is only temporary.

I have mentioned previously that wash primers, due to their low-film build and the discontinuous nature of the film, could not be considered to be anti-corrosive coatings in their own right, but should be considered as a foundation on which to build a fully-protective system. However, it can be shown that wash primers can provide adequate protection for limited periods, making them suitable for use as temporary protectives or 'shop' primers.

Reasonable protection

A look at Table 3 will show that all the primers provided reasonable protection for both aluminium and mild steel for 12 months—a low Re reading indicates little corrosion of the substrate. In this respect the single-pack systems were not inferior to the two-pack primers.

It has often been argued that coatings based on two-pack systems may suffer from the disadvantages of faulty measurement of quantity, inadequate mixing and short pot life. Work at AWRE has shown that, as far as initial adhesion to aluminium and mild steel is concerned, the manner of mixing, mixing ratio and pot life before application are relatively unimportant, providing the variations are not great. The mixing ratio can, therefore, be varied within the limits 35 base:65 acid to 65 base:35 acid without materially affecting the adhesion.

From a consideration of corrosion resistance, however, things are rather more critical and a more-acid component than that recommended should not be used, as this will lead to a loss in corrosion resistance. Where wash primers are to be used as single-coat protective systems there would appear to be a positive advantage in reducing the amount of acid component, as this reduction appears to give enhanced corrosion protection. The corrosion resistance of the primer deteriorates with increased storage time in the mixed condition and material should be used within 16 hours of mixing.

To summarise, wash primers of both the two- and single-pack varieties are useful and versatile coatings having excellent adhesion to a wide range of metallic substrates. Wash primers also provide some measure of corrosion resistance when used as single coats but their real forte lies in their use as the first coat in a multi-coat system. Finally, I must repeat that there is no evidence to support the name etch primer, and this must be considered to be a misnomer.

More information: Mr. P. Walker, Atomic Weapons Research Establishment, Aldermaston, Reading, Berks. RG7 4PR. Tel: Tadley (07356) 4111, ext. 5012/7659.

UKAEA photographers take honours

A lion's share of the honours in this year's Financial Times *Industrial Photography Awards was taken by photographers from the United Kingdom Atomic Energy Authority. Brian Goodman, UKAEA senior photographer, was selected Industrial Photographer of the Year out of an entry of 67. Mr. Goodman also took first prize in category 3 for the best black and white photograph suitable for general use. Eric Willmott, chief press photographer for UKAEA, shared with another photographer first prize in category 2 for the best colour photograph. The photograph reproduced here is one of the portfolio of four which earned for Brian Goodman the top industrial photographer title. It shows Atomat nucleonic gauges being used to measure thickness of tyre cord on a calender machine in the Melksham Wiltshire, factory of the Avon Rubber Company. His three other photographs in the folio featured the ZEBRA zero power fast reactor at Winfrith, the ZENITH II zero energy reactor, also at Winfrith and crystallisation work at the Radiochemical Centre, Amersham. The winning photograph in category 3 depicted the Harwell Van de Graaff electrostatic accelerator stack. Eric Willmott's winning colour photograph was of fuel elements in the cooling pond at AERE, Harwell. Mr. Willmott's portfolio was also highly commended in the main competition.*

£Millions can be saved in industry by knowledge now available

-progress in practical application

The drive to link new Industrial Technologies with Management

Tribology

'Probably £500 million per year can be saved by the application of existing knowledge. This is significant both for the economic well-being of the nation and the reputation of UK engineering products.'

H. Peter Jost, CBE,
(Chairman, DTI Committee on Tribology)

Tribology is the science and technology of interacting surfaces, i.e. rubbing, sliding and rolling, and includes the design of bearings, the application of lubricants and the environments in which surfaces interact.

By bringing together the expertise of the mechanical engineer, the metallurgist, the lubrication engineer, the physicist and the chemist, tribology enables greater reliability and durability to be built into any product.

Tribology Centres at Leeds, Risley and Swansea, in addition to the National Engineering Laboratory at East Kilbride, have already successfully assisted more than 1000 industrial firms, in many cases to increased profitability.

Data sheets and a comprehensive handbook are in preparation, to make easily digested information available to designers, draughtsmen, operational and maintenance staff. Many courses in the subject have also been created at universities and technical colleges.

Terotechnology

'On maintenance alone £550 million per year can be saved'

Major-General Sir Leonard Atkinson, KBE,
(Chairman, DTI Committee for Terotechnology)

Terotechnology is concerned with the installation, commissioning, maintenance, replacement and renewal of plant, machinery and equipment, and the feedback of information to design and operation.

Corrosion

It has been estimated *(Hoar Report)* that about £300 million a year could be saved if existing corrosion protection technology were more widely applied in design and operation.

Materials handling

Is the technology of economically and safely moving and storing materials. It is of vital concern to the manufacturing, service and distribution industries.

The National Materials Handling Centre at Cranfield provides courses, information, advice and research for equipment manufacturers and users.

EVENTS

Terotechnology Conference (theme – New Ideas for Industrial Cost Reduction), Bristol, May 9-12, 1973. Tickets from the Institution of Plant Engineers.

5th International Materials Handling Exhibition, Kelvin Hall, Glasgow, May 14-19, 1973.

Corrosion and Corrosion Protection Conference (with emphasis on pressure vessels). The Institution of Mechanical Engineers, London, May 16-17, 1973. Admission by ticket. Open to all.

Tribology Exhibition (in conjunction with publication of designers' Tribology Handbook), Design Centre, London, July 11 – August 4, 1973.

EUROTRIB 73 – Tribology and Reliability, First European Tribology Congress, September 25-27, 1973. Details from the Institution of Mechanical Engineers.

International Conference – Packages, Pallets and Containers in International Trade, Royal Garden Hotel, London, November 8-9, 1973. Details from The Institute of Materials Handling.

'A common feature of these industrial technologies is that for each of them there is a large stock of existing knowledge arising from past research, much of it funded by Government. Increased application of this knowledge offers the prospect of very considerable improvements in industrial efficiency. The total potential savings to industry could amount to £1500 million a year.'

Gilbert A. Hunt, CBE,
(Chairman, DTI Committee for Industrial Technologies)

Department of Trade and Industry (M4) Room 540, Abell House, John Islip Street, London SW1P 4LN

Name _____ (BLOCK CAPITALS PLEASE)

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Company _____

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Please send me information on:

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THE COMMITTEE FOR

Industrial Technologies

03

Issued by the Department of Trade and Industry

news

Save £1,500 million a year

Industry could save as much as £1,500 million a year by harnessing the results of technological research and existing knowledge. This was stated by Mr. Christopher Chataway, Minister for Industrial Development, at the beginning of March when launching a campaign by the Committee for Industrial Technologies to make management more aware of the enormous potential benefits of applying industrial technologies.

Mr. Chataway declared: 'The practical application by industry of these technologies, which cut across the traditional boundaries of a number of disciplines, just has not kept pace with the advance in knowledge. Our aim in this campaign is to get across to all sectors of engineering industry the enormous savings to be made from adopting these techniques.'

The Committee for Industrial Technologies was set up last year by the Department of Trade and Industry to advise on promoting the economic benefits of multidisciplinary technologies, which at present include tribology, terotechnology, corrosion technology and materials handling. Chairman of the committee is Mr. Gilbert A. Hunt, managing director and chief executive of Chrysler UK Ltd. The committee's membership is drawn from a wide range of industrial, academic and professional organisations at senior level.

The current campaign is taking the form of a balanced information and publicity programme, collaboration with educational and professional bodies and the provision and co-ordination of technical advisory services.

A series of meetings is being held as part of the campaign, the first of which was due to take place on March 29 at the Institution of Mechanical Engineers in London. Entitled 'Education and Training for Multidisciplinary Subjects', the meeting was organised jointly by DTI and the Council of Engineering Institutions. Details of some other events are given in the advertisement appearing in this issue of *New Technology*.

More information: The Department of Trade and Industry, Industrial Technologies Secretariat (M4), Room 540, Abell House, John Islip Street, London SW1P 4LN. Tel: 01-834 4422, ext. 341.

Conference on composites

A conference on 'Composites—Standards, Testing and Design' is to take place at the National Physical Laboratory, Teddington, Middlesex, from April 8-9, 1974. The conference is being held to highlight and discuss design problems inhibiting the effective use of composites as engineering materials, and to identify the needs for standards and tests for the safe, efficient and economic use of composites.

It is intended to cover all important areas where the use of composites is likely to grow, including the aircraft, marine, transport, building, chemical and civil engineering industries. All types of fibrous and particulate fillers in both brittle and plastic matrices will be included in the conference's coverage. There will be keynote papers by invited speakers, supplemented by shorter contributions.

Overnight accommodation will be arranged at a nearby hall of residence, and the conference fee will include the cost of residence, catering, preprints and published proceedings.

More information: Mr. R. P. Miller, Division of Inorganic and Metallic Structure, National Physical Laboratory, Teddington, Middlesex. Tel: 01-977 3222, ext. 3803.

Oil pollution plans being tested

A series of exercises to test the limits of Britain's ability to deal with coastal oil pollution was announced on February 27 by Mr. Michael Heseltine, Minister for Aerospace and Shipping, when opening a two-day Symposium on Marine Pollution at the National Physical Laboratory, Teddington. The symposium had been organised by the Royal Institution of Naval Architects. The Minister is shown (centre) in the accompanying picture with Sir Alfred Sims, president of RINA (left), and Dr. J. V. Dunworth, director of NPL. Among the papers presented at the symposium was one by Mr. J. N. Archer, head of the marine division in the Department of Trade and Industry, who assessed the prospects for the IMCO International Conference on Marine Pollution being held from October 8 to November 2 this year. Mr. G. Victory, engineer surveyor-in-chief in the marine division of DTI, presented a paper 'The Load on Top System, Present and Future.'

International Organisation of Legal Metrology (OIML)

The following documents have been circulated by OIML to member-countries for comment:

Titles: Casks and barrels.
Material measures of length.
Heat meters.
Electrical transformers for metering.

References: Draft International Recommendations.

Copies may be obtained from Standards, Weights and Measures Division, Department of Trade and Industry, Abell House, John Islip Street, London SW1P 4LN.

Where goes NCC?

The National Computing Centre is asking individuals and organisations to give their views on where they feel NCC can best provide guidance, help and support to British computing. A review body is currently considering the role of the Centre and how it can best meet its objectives over the next five years. The central purpose of NCC is to increase the effective use of computers.

Observations to: Mr. Fraser Mitchell, Chairman of the NCC Review Body, c/o Coopers and Lybrand, Lyndon House, Hagley Road, Edgbaston, Birmingham B16 8PN.

Tribology courses

Three one-day courses on aspects of tribology are taking place during the coming months.

On April 11, a course on 'Bearing Design' is being sponsored by the National Centre of Tribology and the Huddersfield Polytechnic at the Huddersfield Polytechnic. Its prime purpose is to help engineers to understand and exploit the engineering sciences data sheets prepared by the Institution of Mechanical Engineers. It is a repeat of a course held at the National Centre of Tribology in October 1970. The course fee of £19, plus VAT, includes data sheets, lunch and refreshments.

Another course on 'Bearing Design' is being sponsored by the National Centre of Tribology and the Institution of Mechanical Engineers at the Institution of Mechanical Engineers in London on May 1. Course fee, including data sheets, lunch and refreshments, is £21, plus VAT.

'Dynamic Seals' is the subject of the course being held at the National Centre of Tribology, Risley, on June 7. Sponsored by the National Centre of Tribology and the North Western Branch of the Institution of Mechanical Engineers, the course is intended to familiarise practising engineers and designers with the functions of the main types of seal and their methods of operation. Course fee, including lunch and refreshments, is £12, plus VAT.

More information and application forms for all courses: Mr. A. J. Walton, National Centre of Tribology, UKAEA, Risley, near Warrington, Lancs. Tel: 0925 31244. ext. 3564.

More information: Where possible, items in *New Technology* indicate the best sources of further information. Readers are advised also to seek information on matters relating to *New Technology* from the following DTI regional offices: Edinburgh, 031-225 1822; Cardiff 62131; Newcastle upon Tyne 27575; Manchester, 061-832 9111; Leeds 38232; Nottingham 46121; Birmingham, 021-643 8221; Bristol 21071; London and South East, 01-684 9781; Eastern, 01-828 4355. In Northern Ireland, information is given by the Dept. of Industrial and Forensic Science, Belfast 645421.

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